by Dr. Th. v. Kármán, who, although a very young man, has no need to apologize for his article, which, although containing fewer formulæ, is written with great clearness and has even better cuts than the English article. To be sure Dr. Kármán had the advantage of reading Professor Love's article as well as his great treatise, but the article is decidedly independent, and concludes with an excellent treatment of elastic hysteresis or Nachwirkung, which is becoming more and more important, and which we do not find mentioned in Professor Love's article. Very likely this is also due to the more recent appearance of the German work. For the biologist we will mention the fifty-three-page article on Descendenztheorie, profusely illustrated, as compared with the "Britannica" article on Evolution, of fifteen pages, without illustrations.

A feature of the present work that is of great importance is found in the biographical sketches, which, although very short, are decidedly helpful. We have looked in vain for the name of Mendel, but find three generations of Becquerels. It is a pleasure to note throughout the work frequent references to the work of Americans, living and dead, of whom we may mention Rowland, Newcomb, Michelson, R. W. Wood, Campbell, E. B. Wilson and W. M. Davis, whose familiar hand is recognized in the admirable drawing of meanderings in the article Fluss. This fact, which is now becoming more and more general, may partially reconcile us to the state of affairs upon which we have commented at the beginning. It may seem premature to review a work that is not yet finished, but it seems of importance to call the attention of the public to this very important and desirable work.

ARTHUR GORDON WEBSTER

July 26, 1913

Studien an intracellularen Symbionten. I. Die intracellularen Symbionten der Hemipteren. By Dr. PHIL. PAUL BUCHNER, Privatdocent in the University of Munich. Reprinted from "Archiv für Protistenkunde," Vol 26. Jena, 1912. Pp. 116, 12 plates and 29 text figures.

For many years students of insect morphology and embryology have noted in the fat body of larval and adult insects and in certain eggs and embryos, peculiar corpuscle- or rod-like bodies, seemingly extraneous in origin and whose nature and function could not be satisfactorily explained.

Thus, as far back as 1850, Leydig observed the appearance, in embryos of viviparous aphids, of "a green or yellow granular mass which at first apparently lay free between the cells, but later massed in spherical form, became enclosed by a membrane, and took part in the formation of the vegetative organs of the insect." This constituted the mass later designated by Huxley and by Lubbock as the "pseudovitellus," a name very generally accepted by embryologists, though some have regarded the mass as having a very specific function. According to Babiani, who demonstrated its origin within an enlarged cell of the follicular epithelium, it represents the vestigial male sex gland of the agamic individual. On the other hand, Witlaczil regarded it in the form of the "green body" of the adult aphid, as an excretory organ, replacing the Malpighian tubes which are lacking in some species.

Of less striking appearance are the bacteroidal bodies found by Blochmann, '84, in the eggs of certain ants and, later, studied more fully by him in the eggs and adult fat body of *Blatta* and *Periplaneta*. These little bodies, which Wheeler, '89, called Blochmann's corpuscles, have also been found in the larval fat cells of *Pieris* and in various orthoptera. They are in the form of minute, straight or slightly bent rods, 6–8 μ long and, as Blochmann was able to determine, multiply by cross division. He was unable to cultivate them, but regarded them as symbiotic bacteria.

In recent years there has accumulated evidence to show that these scattered structures are related and that Blochmann was right in interpreting them as symbiotic forms. Many such suggestions appear in the literature of the past fifteen or twenty years, but it is especially the work of Mercier (1906), Sulc (1906

and '10), of Pierantoni (1909 and '10), who succeeded in isolating and growing certain forms in pure culture, that has furnished the basis for a correct interpretation and for a comprehensive study of these bodies in the various groups of insects.

Such a study has been commenced by Dr. Buchner and the extensive paper before us considers primarily the intracellular symbionts of the hemiptera. There is a very full historical discussion which will be of great value to other students of the general subject, and which will serve to put the reader, be he botanist or zoologist, *en rapport* with the topic. Then follows a detailed discussion of the author's own investigations.

Of special interest are the data on the method of infection of the developing eggs by the organisms. This may take place in a diffuse manner, as in the cockroaches, or it may be very definitely localized, as in the aphids. In any event, we are concerned with a hereditary transmission of bacteria-like or yeast-like organisms.

Concerning the systematic position of the forms studied there is little definite to be said, though it is certain that the intracellular symbionts of insects, as we know them at present, do not represent a closely definable group. The forms in the cockroaches are apparently true bacteria and probably so also are those of the ants.

On the other hand, the multiplication by budding, the type of mycelial formation, the lack of structures comparable to spore of bacteria, the constant presence of a nucleus, and other characters in the other forms studied are suggestive of the yeasts, and it is here that most of the recent students of the subject are inclined to place them. Thirty-four species, some of them new, loosely grouped here, are described and figured.

It is obvious from Buchner's studies that these puzzling organisms are not to be regarded as parasites. So striking are some of the specializations and adaptations which their presence has brought about, that it is equally impossible to regard them as mere commensals. But certain as the author is that he is dealing with true symbionts, he is unable to explain, satisfactorily, the advantage which accrues to the host.

Dr. Buchner's work is of fundamental importance, but one must agree with him that it is but a beginning. With the foundation work done, the next few years should see wonderful advance in our knowledge of this difficult subject.

Wm. A. Riley

Cornell University

BOTANICAL NOTES

Some statistics as to the flowering plants

In this inquiry I have considered only the proper Flowering Plants, Anthophyta or "Angiospermae," and have given most of the numbers in thousands, for easier memorizing.

Number of species of Flowering Plants	±132,500
Dicotyledons	±108,800
Monocotyledons	± 23,700
In the Dicotyledons:	
Axiflorae	± 54,000
Calyciflorae	± 54,000
In these again:	
Axiflorae—apopetalae	± 29,000
Axiflorae—gamopetalae	± 25,000
Calyciflorae—apopetalae	± 33,000
Calyciflorae—gamopetalae	± 21,000
So there are:	
Of Apopetalous Dicotyledons	± 62,000
Of Gamopetalous Dicotyledons	± 46,000
Again, there are in Dicotyledons:	
Ovaries, superior	± 72,000
Ovaries, inferior	± 36,000
Those with superior ovaries are distributed as follows:	
In Apopetalous species	± 50,000
In Gamopetalous species	± 22,000
Those with inferior ovaries are distributed as follows:	
In Apopetalous species	± 14,000
In Gamopetalous species	± 22,000
In the Monocotyledons:	
With ovaries superior	± 12,000
With ovaries inferior	± 11,000
In Monocotyledons gamopetaly has not become established.	
So there are in the Flowering Plants:	
Of Apopetalous species	± 86,000
Of Gamopetalous species	± 46,000